



Hierarchical Resource Manager

**Arie Shoshani
Alex Sim
Junmin Gu
Andreas Mueller**

**Scientific Data Management Research Group
NERSC
Lawrence Berkeley National Laboratory**



IDL comparison– Definitions

- OLD

```
typedef double TIME_OUT_T;
typedef string USER_ID_T;
typedef string REQUEST_ID_T;
typedef string FID_T;
typedef sequence<FID_T> FIDSET_T;
```

- NEW

```
exception HRMException {
    string why;
};

typedef double TIME_OUT_T;
typedef string USER_ID_T;
typedef string REQUEST_ID_T;
typedef string FID_T;
typedef sequence<FID_T> FIDSET_T;
typedef string HINT_T;
enum MODE_T {
    PULL, PUSH
};
struct REQUEST {
    FID_T fid;
    string source_url;
    string target_url;
    double size;
    HINT_T hint;
};
typedef REQUEST REQUEST_T;
typedef sequence<REQUEST_T>
REQUEST_SET_T;
```



IDL comparison– Definitions

- OLD

```
enum RETURN_CODE_T {  
    STAGE_QUEUED,  
    STAGE_DONE,  
    STAGE_FAILED,  
    NOT_ENOUGH_SPACE,  
    FILE_DOES_NOT_EXIST,  
    PURGE_DONE,  
    PURGE_FAILED,  
    ABORT_DONE,  
    ABORT_FAILED,  
    MSS_DOWN,  
    MSS_ERROR,  
    FILE_TIMED_OUT,  
    DUPLICATE_REQUEST_ID  
};
```

- NEW

```
enum RETURN_CODE_T {  
    REQUEST_QUEUED,  
    REQUEST_DONE,  
    REQUEST_FAILED,  
    NOT_ENOUGH_SPACE,  
    FILE_DOES_NOT_EXIST,  
    RELEASE_DONE,  
    RELEASE_FAILED,  
    ABORT_DONE,  
    ABORT_FAILED,  
    MSS_DOWN,  
    MSS_ERROR,  
    FILE_TIMED_OUT,  
    DUPLICATE_REQUEST_ID,  
    FILE_TRANSFER_DONE,  
    FILE_PINNED,  
    FILE_LIMIT_REACHED,  
    FILE_SIZE_LIMIT_REACHED,  
    USER_NOT_AUTHORIZED,  
    NO_DIRECTORY_PERMISSION,  
    FILE_WRITTEN_ON_TAPE,  
    PULL_FILE_COMPLETE,  
    SPACE_ALLOCATED  
};
```



IDL comparison– Definitions

- OLD

```
typedef sequence<string> PROTOCOL_SET_T;
struct RETURN_STATUS {
    FID_T fid;
    RETURN_CODE_T code;
    string explanation;
};
typedef RETURN_STATUS RETURN_STATUS_T;
typedef sequence<RETURN_STATUS_T>
    RETURN_STATUS_SET_T;
struct URL_INFO {
    FID_T fid;
    string url;
    RETURN_STATUS_T status;
    TIME_OUT_T timeout;
};
typedef URL_INFO URL_INFO_T;
typedef sequence<URL_INFO_T>
    URL_INFO_SET_T;
struct TIME_ESTIMATE {
    FID_T fid;
    double timeRemaining;
    RETURN_STATUS_T status;
    TIME_OUT_T timeout;
};
typedef TIME_ESTIMATE TIME_ESTIMATE_T;
typedef sequence<TIME_ESTIMATE>
    TIME_ESTIMATE_SET_T;
```

- NEW

```
typedef sequence<string> PROTOCOL_SET_T;
struct STATUS_CODE {
    RETURN_CODE_T code;
    string explanation;
};
typedef STATUS_CODE STATUS_CODE_T;
struct RETURN_STATUS {
    FID_T fid;
    STATUS_CODE_T code;
};
typedef RETURN_STATUS
    RETURN_STATUS_T;
typedef sequence<RETURN_STATUS_T>
    RETURN_STATUS_SET_T;
struct FILE_STATUS {
    FID_T fid;
    string returnUrl;
    double timeToService;
    STATUS_CODE_T status;
    TIME_OUT_T timeout;
};
typedef FILE_STATUS FILE_STATUS_T;
typedef sequence<FILE_STATUS_T>
    FILE_STATUS_SET_T;
```



IDL comparison – HRMServant

- OLD

```
string systemStatus();
RETURN_STATUS_SET_T stage(
    in USER_ID_T uid,
    in REQUEST_ID_T request_id,
    in client_call_back ref,
    in FIDSET_T fset
);
URL_INFO_SET_T getUrls(
    in USER_ID_T uid,
    in REQUEST_ID_T request_id,
    in PROTOCOL_SET_T pset,
    in FIDSET_T fset
);
```

- NEW

```
FILE_STATUS_SET_T request_to_get(
    in USER_ID_T uid,
    in REQUEST_ID_T request_id,
    in client_call_back ref,
    in PROTOCOL_SET_T pset,
    in REQUEST_SET_T fset,
    in MODE_T mode
) raises (HRMException);
FILE_STATUS_SET_T request_to_put(
    in USER_ID_T uid,
    in REQUEST_ID_T request_id,
    in client_call_back ref,
    in PROTOCOL_SET_T pset,
    in REQUEST_SET_T fset,
    in MODE_T mode
) raises (HRMException);
```



IDL comparison – HRMServant

- OLD

```
RETURN_STATUS_SET_T abort(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in FIDSET_T fset  
);  
RETURN_STATUS_SET_T release(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in FIDSET_T fset  
);  
TIME_ESTIMATE_SET_T status(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in FIDSET_T fset  
);  
PROTOCOL_SET_T getSupportedProtocols();
```

- NEW

```
RETURN_STATUS_SET_T abort(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in FIDSET_T fset  
) raises (HRMException);  
RETURN_STATUS_SET_T release(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in FIDSET_T fset  
) raises (HRMException);  
FILE_STATUS_SET_T status(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in FIDSET_T fset  
) raises (HRMException);  
PROTOCOL_SET_T getSupportedProtocols()  
raises (HRMException);  
void file_transfer_done(  
    in USER_ID_T uid,  
    in REQUEST_ID_T request_id,  
    in REQUEST_T file)  
raises (HRMException);
```



IDL comparison – HRMServant

- OLD

```
double getTransferRate();
double getTransferTimeEstimate(
    in string token,
    in FIDSET_T fset
);
short getNumberTransferPending();
short getNumberTransferAllowed();
short getNumberRequestsQueued();
double getCacheSizeUsed();
double getCacheSizeAllocated();
```

- NEW

```
interface HRMInfo {
    double getTransferRate()
        raises (HRMException);
    double getTransferTimeEstimate(
        in FIDSET_T fset
    ) raises (HRMException);
    short getNumberTransferPending()
        raises (HRMException);
    short getNumberTransferAllowed()
        raises (HRMException);
    short getNumberRequestsQueued()
        raises (HRMException);
    double getCacheSizeUsed()
        raises (HRMException);
    double getCacheSizeAllocated()
        raises (HRMException);
};
```



IDL comparison– client_ball_back

- OLD

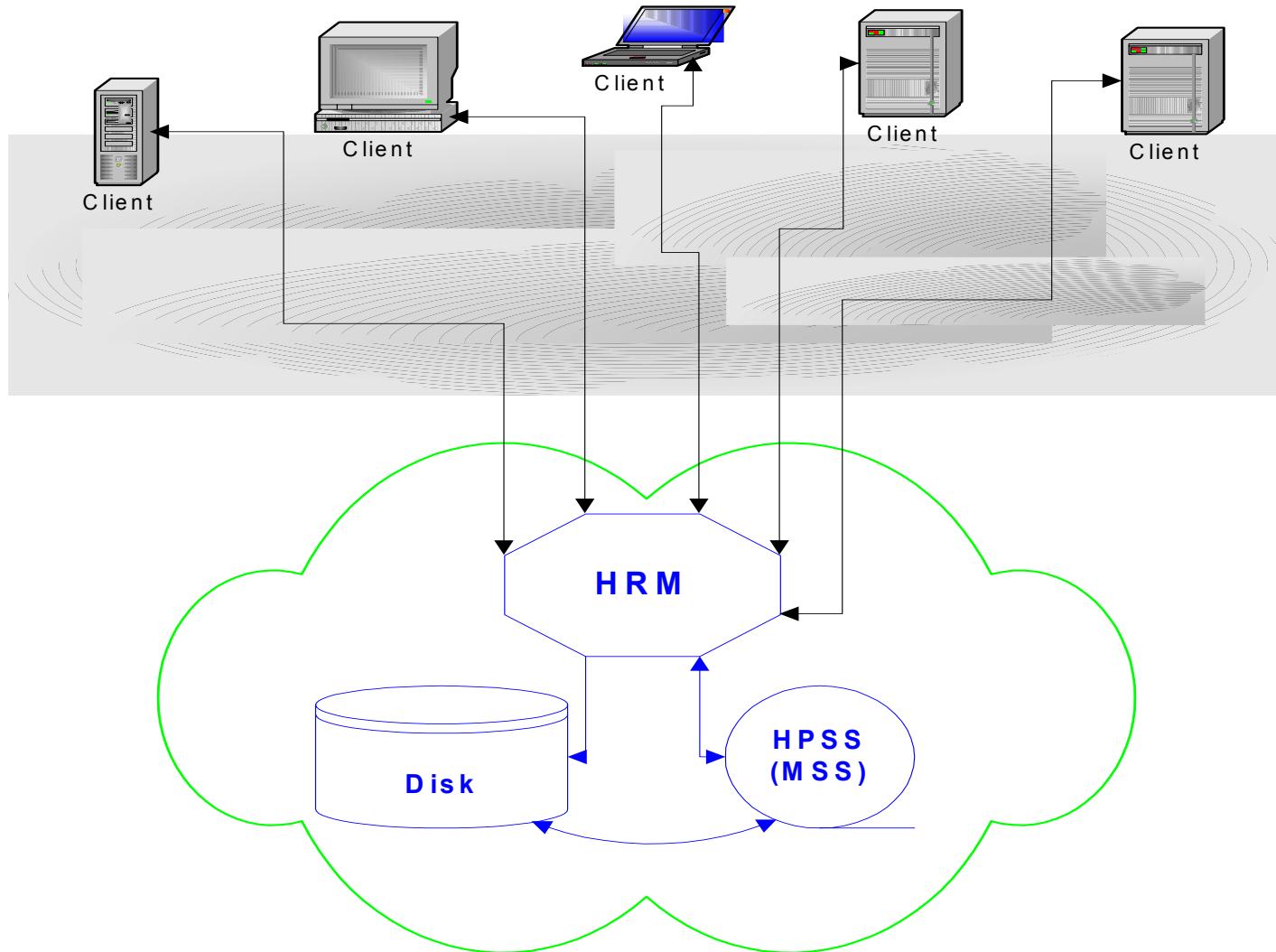
```
boolean staged(  
    in REQUEST_ID_T request_id,  
    in RETURN_STATUS_SET_T status_set  
)
```

- NEW

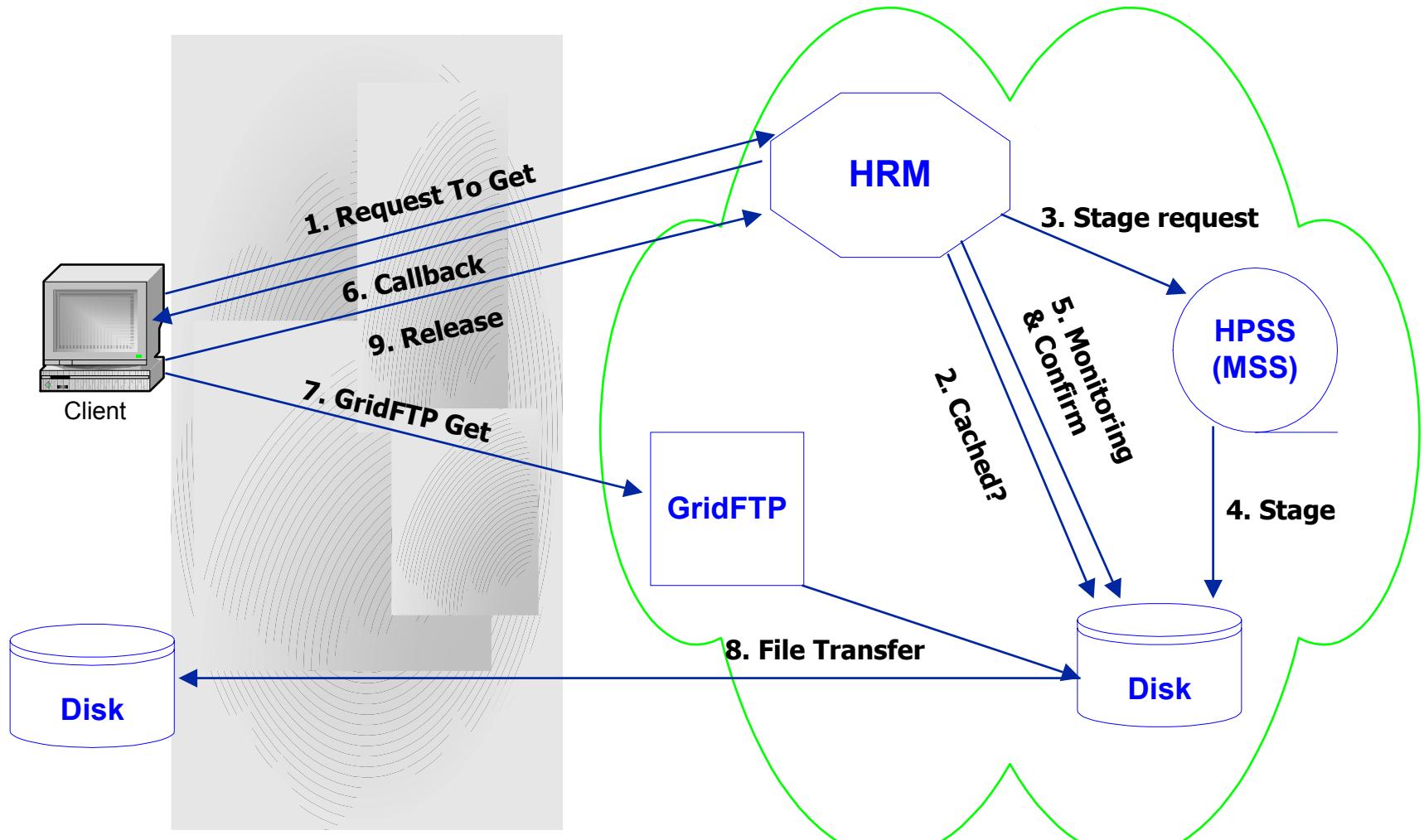
```
oneway void message(  
    in REQUEST_ID_T request_id,  
    in FILE_STATUS_SET_T status_set  
)  
boolean areyoualive()  
raises (HRMException);
```



HRM Architecture



Request To Get - Pull





Request To Get - Pull

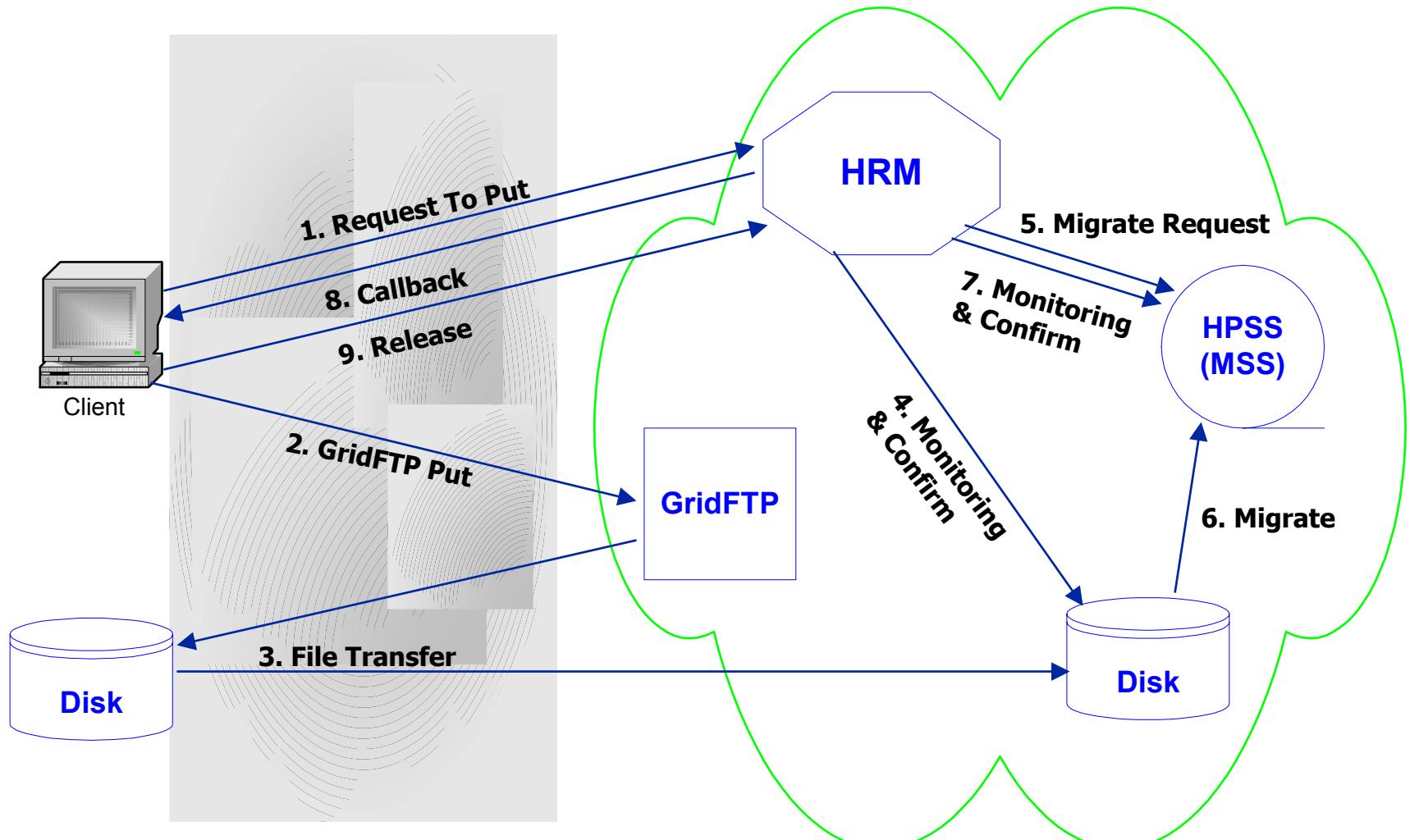
- **File transfer from source URL to target URL**
- **Client provides source URL**
- **Return target URL to the client**



Request To Get - Push

- **File transfer from source URL to target URL**
- **Client provides source URL and target URL**
- **Return target URL to the client**

Request To Put - Push

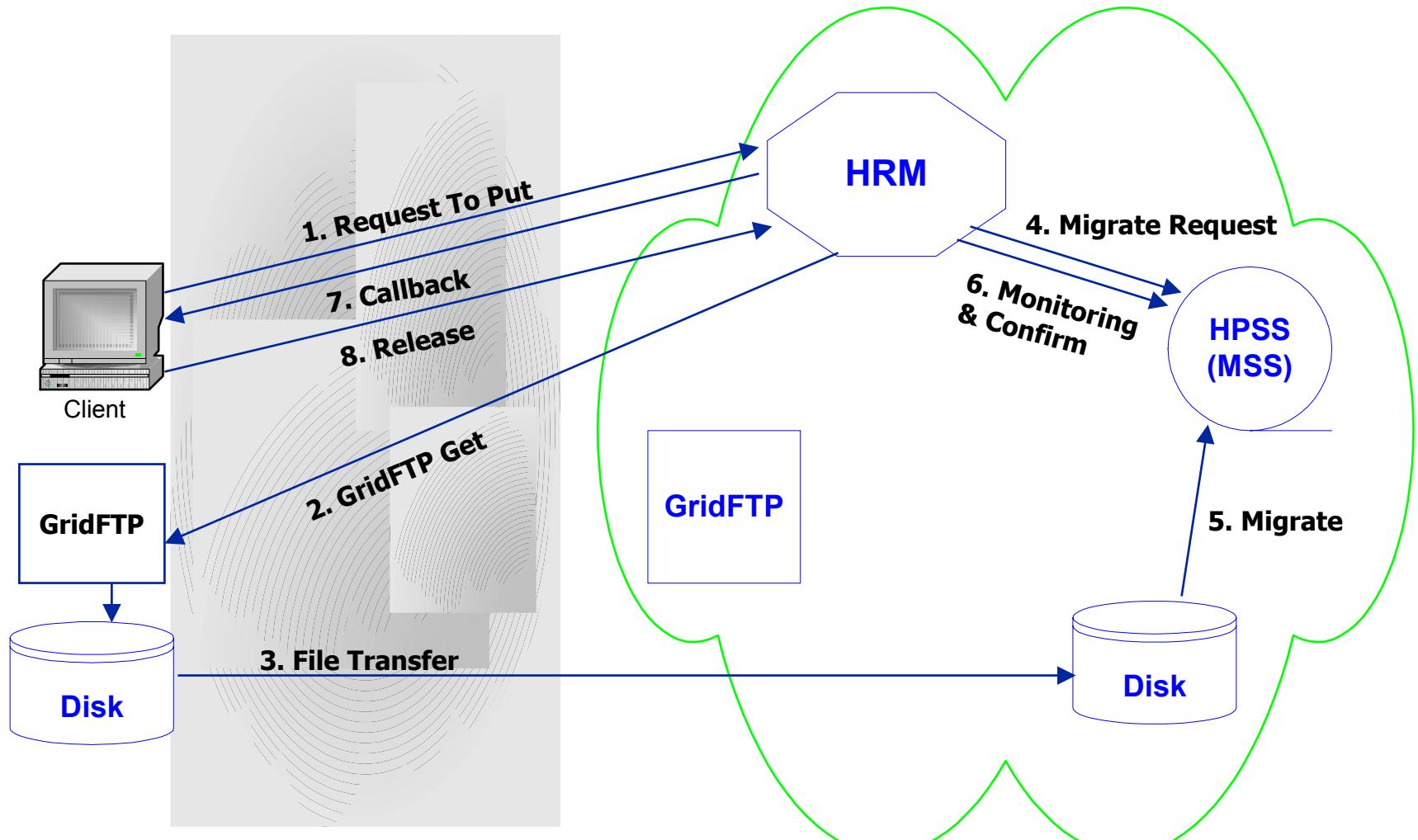




Request To Put - Push

- **File transfer to target URL**
- **HRM provides temporary target URL to the client**
- **Client pushes the file on source URL to the temporary target URL**
- **Client provides target URL**
- **HRM transfers from temporary target URL to target URL**

Request To Put - Pull





Request To Put - Pull

- File transfer to target URL
- Client provides source URL and target URL
- HRM initiates file transfer from source URL to temporary target URL
- HRM transfers from temporary target URL to target URL